



Algorithm of the Risk of Ship-Bridge Collision Considering Ship's Dimension

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Abstract

The issue of ship collision with bridge is very important topic in the academic research, however, the studies only regard the ship as a particle at present, ignoring the size of the ship, which cause the accuracy of the active early warning system cannot meet the requirements of practice. In this paper, proposes the algorithm of the risk of ship-bridge collision considering the ship's dimension, including the LOA and B_{MAX} . First, utilizing the mercator projection method to make conversion of coordinate system. Secondly, analysing the relationship of geometric position based on the ships, bridge piers and channel to constructe the algorithm of the risk ship collision with bridge. Thirdly, the active early warning strategy is proposed depending on the value from the described algorithm. Finally, the reliability of the algorithm is validated by case study. It can improve the accuracy of the risk of ship-bridge collision significantly, and conducive to the application of the warning system.

Keywords: ship collision with bridge; ship's dimensions; position coordinates; risk degree; channel centreline.

1 Introduction

With the development of economy and water transportation, the accidents of ship-bridge collision is increasing^[1], which makes the navigational environment be complicated sharply, and the potential risk of ship collision with bridge is concerned widely by the industry. In order to deal with the adverse effects of uncertain factors such as human factor in the accidents, an active early warning system for ship-bridge collision avoidance was born at the right moment. The key to the function of the system dependding on the core index of the risk of ship collision with bridge which touching off the facilities and equipment for warning. The algorithm of the risk of ship-bridge collision and the strategy of early warning are the

core key of the system. It is the critical key that the system can be applied to practice really.

Over the years, domestic and foreign scholars have studied the algorithm of ship collision risk from different aspects. Through literature research, the author found that: (1) The traditional methods for anti-collision for bridge only focused on itself, it just depend on its' strong structure to against ship collision in order to minimize the loss. For example, Keke Peng^[2] adopted AASHTO method to calculate the ship-bridge collision probability from the perspective of bridge; Tao Fu^[3] studied ship collision with bridge based on structural reliability theory; (2) Most of the research adopted subjective qualitative analysis method at present, and only a few scholars studied it from an objective perspective. For example, Yihua Liu^[4] designed an algorithm to describe the risk of ship-bridge